Research-in-progress

Examining people's implicit smartphone use attitudes via an adapted IAT procedure

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Abstract

Examining attitudes can foster the understanding of smartphone use (Serenko & Turel, 2018). Currently, only smartphone users' explicit attitudes are examine via self-reports (Gawronski & De Houwer, 2014). However, as the findings are quite paradoxical (Kumar & Sriram, 2018; Rainie & Zickuhr, 2015; Vandendriessche & De Marez, 2020), it can be stated that these attitudes do not tell the whole story (Serenko & Turel, 2018). Since implicit attitudes are particularly salient in routinized technology use settings, the investigation of these can help to complete the story. The specific situation and context of smartphone use must also be included into this investigation (Arminen, 2006; Nickerson et al., 2008). To do so, our implicit association task (n = 85) tries to examine the direction and strength of a link of appropriateness with smartphone use situations. The preliminary results show that specific situations indeed seem to be important (Arminen, 2006; Nickerson et al., 2008). The 'individual situations' were significantly more categorized as appropriate, while the 'interacting situations' were significantly more categorized as inappropriate. Further analyses of D scores are needed, just as further research to increase the – currently low – consistency rates. However, it seems true that this adapted IAT procedure can be an interesting addition to multimethod research (Serenko & Turel, 2018), as it potentially offers interesting insights that are otherwise inaccessible via explicit self-reports (Nosek et al., 2011).

Key words

IAT task
Implicit measures
Smartphone use attitudes
Multimethod research

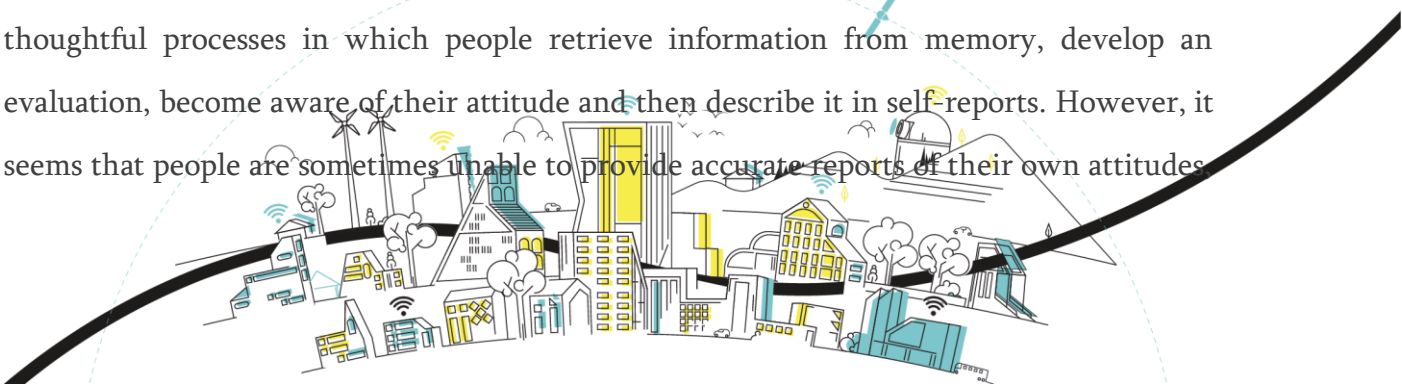
Submission details

Theoretical background

An attitude can be defined as a psychological evaluation, feeling, or tendency towards an object, human or situation, involving some degree of (dis)favour (Eagly & Chaiken, 1995; Khatun et al., 2017). Consequently these evaluations inform our reasoning about actions, which potentially translates into behaviour (Kraus, 1995). In this way, examining attitudes can foster the understanding of smartphone use (Serenko & Turel, 2018), which is necessary as paradoxical findings are common.

Kumar and Sriram (2018) found that even explicit negative smartphone perceptions do not prevent people from daily automatic smartphone use (Roh et al., 2018), driven by 'entrenched' habits (Oulasvirta et al., 2012). This is in line with the 'dependence paradox': whereas people have often fully adopted the smartphone, they experience difficulties with dependence and try to control these by applying 'DIY rules'. However, these rules often turn out as ineffective in stopping automatic smartphone use (Vandendriessche & De Marez, 2020). Rainie and Zickuhr (2015) also showed that many Americans regard the smartphone as distracting from and harmful to social interaction, even while they cannot resist the temptation themselves. These paradoxical findings stem from self-reports, investigating smartphone users' explicit attitudes, which are among the most important research tools in social sciences (Gawronski & De Houwer, 2014).

Explicit attitudes, as examined in the aforementioned studies, are constructed by thoughtful processes in which people retrieve information from memory, develop an evaluation, become aware of their attitude and then describe it in self-reports. However, it seems that people are sometimes unable to provide accurate reports of their own attitudes



since they are not always fully aware of them (Nosek et al., 2011). These descriptions are also often adjusted to what participants consider to be the expected or desired attitudes (Turel et al., 2011). As a consequence of both, self-reports are often biased (Fazio & Olson, 2003). Also, as is shown by the paradoxical findings, and in line with the dual-attitude model of Serenko and Turel (2018), explicit attitudes do not tell the whole story as to by which factors smartphone use is driven.

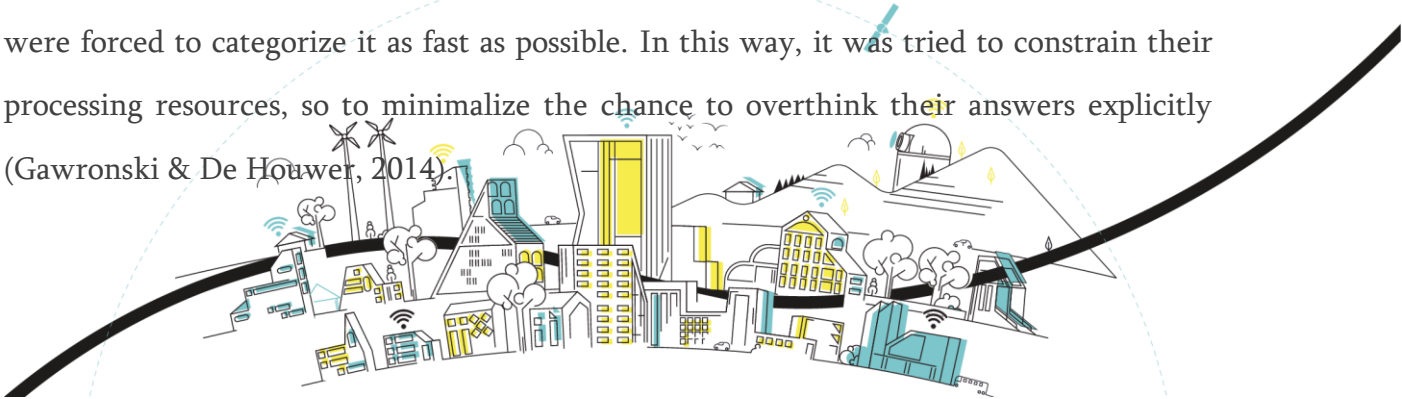
Since implicit attitudes are particularly salient in routinized technology use settings, such as – mostly habitual – smartphone use (Oulasvirta et al., 2012), supplementing smartphone research with these attitudes can shed light on the experienced paradoxes. These implicit evaluations are stored in fast-access memory, and are activated unconsciously in response to associated stimuli. In this way, it can directly drive smartphone use behaviour by bypassing and influencing the often-studied explicit, rational mechanisms. So, while both types of attitudes clearly differ in its mechanisms, both can affect smartphone behaviour. Examining implicit attitudes also overcomes the limitations linked with self-reports, since it reduces participants' ability to control their responses and since it does not require – often difficult – introspection (Gawronski & De Houwer, 2014; Nosek et al., 2011) about habitual smartphone use.

In the present study, the implicit attitudes towards smartphone use are indirectly investigated (Egloff & Schmukle, 2002; Roh et al., 2018) by means of the implicit association task, IAT (Greenwald et al., 1998). This task consists of two binary categorization tasks, combined in a manner that is either compatible or incompatible with the psychological attributes under examination (Gawronski & De Houwer, 2014). The strength of the association of the implicit attitude toward the target object will influence the categorization performance. Participants will execute it faster when the response mapping is compatible, while the perfomance will be impaired when the key mapping is incompatible (Gawronski & De Houwer, 2014). In this way, an IAT task aims to measure the strength of vast association (Hargadon et al., 2018).

However, the proposed IAT task is used in a somewhat different, more detailed way: our IAT task rather tries to examine the direction and strength of a particular link for each participant, in each situation in which a smartphone can be used. As a matter of fact, previous (explicit) research namely has shown that attitudes may differ because of the specific situation and context in which the smartphone is used (Arminen, 2006; Nickerson et al., 2008). Namely, while the smartphone can be used anywhere and anytime, it is seen as less acceptable in more intimate settings (Rainie & Zickuhr, 2015), or social situations with co-located people (Lever & Katz, 2007). More specifically, the majority found it unacceptable to use smartphones during meetings, in restaurants or at family dinners (Rainie & Zickuhr, 2015). The main motivation for this is that smartphones are considered capable of interrupting social interactions (Nickerson et al., 2008). Therefore, the stimuli in the proposed IAT task comprises, amongst others, 11 different situations which must be categorized as acceptable or inacceptable smartphone use. Some of the situations can be regarded as 'individual situations', whereas others can be seen as 'interacting situations'. Based on previous evidence, it seems that smartphone use in individual situations will mostly be categorized as appropriate, while smartphone use in interacting situations will be perceived as inappropriate.

Procedure

Our IAT task was developed via the lab JS tool (Henninger et al., 2019) which means that participants had to complete the task on a computer. The task consisted of five different blocks. At the beginning of each block, specific instructions were shown. Each trial of a block consisted of the same sequence. First, a fixation cross was presented for 500 ms. In this way, participants were focused on the position where a picture or word was presented in the next step. The presentation duration of this stimulus was not limited, but participants were forced to categorize it as fast as possible. In this way, it was tried to constrain their processing resources, so to minimalize the chance to overthink their answers explicitly (Gawronski & De Houwer, 2014).



In total, 85 adults with a parental role fulfilled this task. There were two versions of the task, so that the order of the compatible and incompatible blocks could be counterbalanced to prevent order-specific effects (Greenwald et al., 1998). The first version was performed by 48 participants, while the others (n = 37) carried out the second version.

The procedure of the first version is outlined in what follows. During the first block, pictures of 11 different situations were shown. Some of these can be seen as 'individual situations', for example household chores, lunching alone, toilet, working alone and relaxing in the seat alone; others can be seen as an 'interacting situations', such as dinner, bed time, breakfast, trip, meeting, relaxing in the seat with partner. Each situation was presented only once in a randomized order, and the participants had to categorize these as 'appropriate' or 'inappropriate', respectively by pressing the left key 'd' and the right key 'k'.

During the second block, participants had to categorize 14 different (Dutch) words as 'positive' and 'negative', also by respectively pressing the left and right key. Half of the words had an inherent positive connotation, for example 'happiness' [geluk]. The other half had an inherent negative connotation, for instance 'failure' [mislukking]. Again, each of these words had been presented only once, in a randomized order. During these first two blocks, the participants learned a particular response mapping, linked with the left and right key. These pictures and words were combined in a third block. This compatible block followed a congruent response mapping, as the appearing picture or word had to be categorized as 'appropriate/positive' by pressing the left key, or as 'inappropriate/negative' by pressing the right key. During block 4, participants were asked again to categorize the words. However, as the response mapping had changed, 'positive' words had to be categorized by pressing the right key, while 'negative' words were linked with the left key. In this way, block 5 was seen as the incongruent or incompatible block, where the appearing picture or word had to be categorized as 'appropriate/negative', by pressing the left key, and 'inappropriate/positive', by pressing the right key.

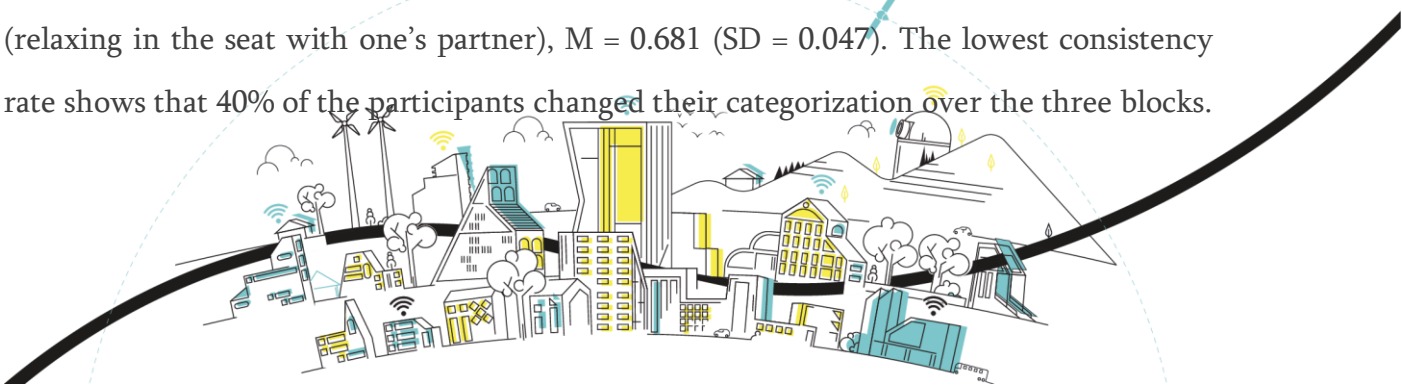
Analysis

Before analyzing the collected data, the data was cleaned. Only the relevant data linked with situation categorization was preserved. Next, in general, invalid response times (> 3000ms) were removed, since these signalled that participants had a chance to overthink their categorization (Gawronski & De Houwer, 2014). Next, participants who showed inconsistent answers on the same situations over block 1, block 3 and block 5 were removed. In this way, the amount of valid responses could differ between each situation.

First of all, the consistency rates were examined for each situation. These proportions reflected the amount of 85 participants who categorized the situation consistently as 'appropriate' or 'inappropriate' in all three relevant blocks. A low consistency rate might indicate that the participants changed their minds about the categorization. Next, the categorization proportions were examined for each situation. In this way, the hypothesized consensus in 'appropriateness' of smartphone use in particular situations was investigated. To do so, Chi-squared tests were conducted, examining whether there is a significant difference between the number of participants who categorized a situation as 'appropriate', compared to those who perceived it as 'inappropriate'. Lastly, D scores were calculated for each participant in each condition (combination of situation and categorization). To do so, the reaction time in the (congruent) third block was subtracted from the reaction time in the (incongruent) fifth block. One could expect to find positive D values. Independent-samples t-tests were also conducted, as a significantly larger D value should suggest a stronger general implicit association linked with one of both categorizations of a smartphone situation.

Preliminary results

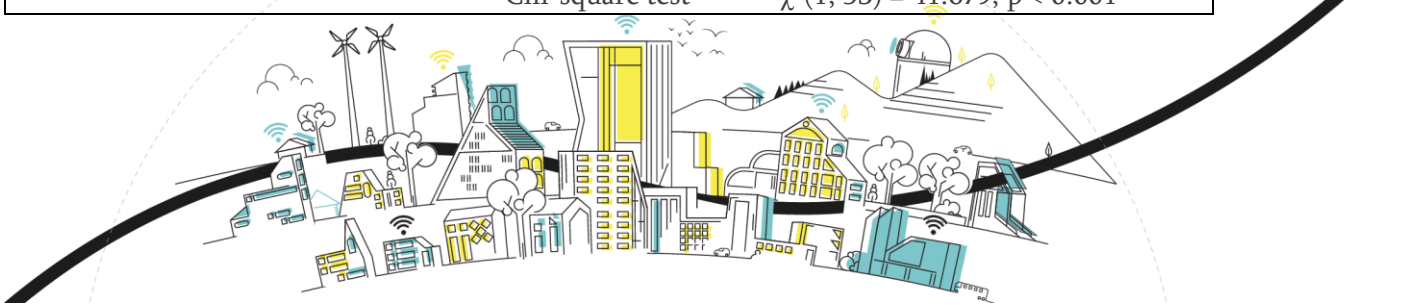
The consistency rates differ for each situation, between a range of 0.600 (meeting) and 0.765 (relaxing in the seat with one's partner), M = 0.681 (SD = 0.047). The lowest consistency rate shows that 40% of the participants changed their categorization over the three blocks.



Situations of smartphone use	Consistency rate
Situation 1: dinner	0.682
Situation 2: bed time	0.706
Situation 3: household chores	0.706
Situation 4: lunching alone	0.647
Situation 5: breakfast	0.624
Situation 6: toilet	0.671
Situation 7: trip	0.671
Situation 8: meeting	0.600
Situation 9: working alone	0.694
Situation 10: relaxing in the seat alone	0.729
Situation 11: relaxing in the seat with partner	0.765
Mean (SD)	0.681 (0.047)

Next, the categorization proportions were examined for each situation by carrying out Chi-squared tests. There was only one situation about which the participants do not reach consensus, namely using the smartphone during household chores.

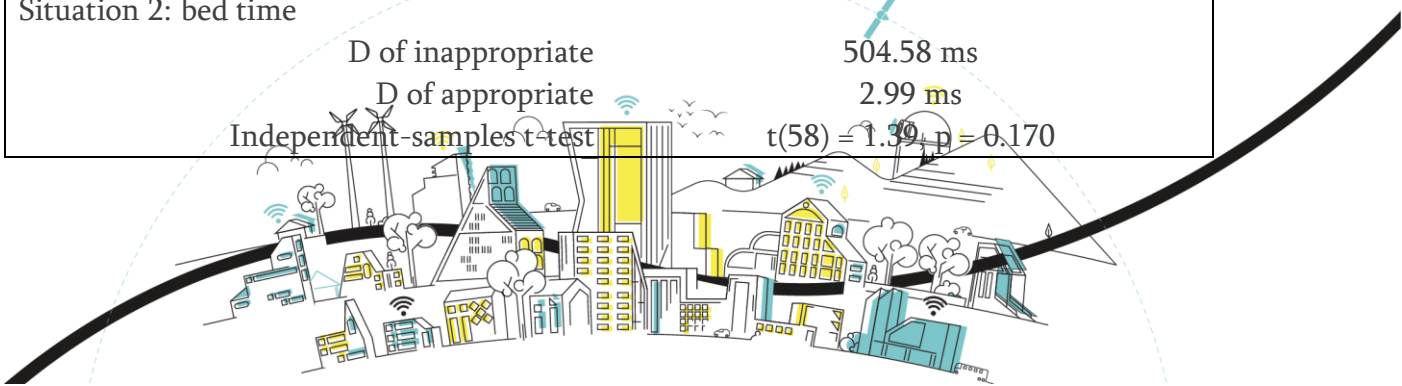
Situations of smartphone use		Categorization proportion
Situation 1: dinner		
	Inappropriate	57
	Appropriate	1
	Chi-square test	$\chi^2(1, 58) = 54.069, p < 0.001^{**}$
Situation 2: bed time		
	Inappropriate	41
	Appropriate	19
	Chi-square test	$\chi^2(1, 60) = 8.067, p = 0.005^{**}$
Situation 3: household chores		
	Inappropriate	35
	Appropriate	25
	Chi-square test	$\chi^2(1, 60) = 1.667, p = 0.197$
Situation 4: lunching alone		
	Inappropriate	9
	Appropriate	46
	Chi-square test	$\chi^2(1, 55) = 24.891, p < 0.001^{**}$
Situation 5: breakfast		
	Inappropriate	50
	Appropriate	3
	Chi-square test	$\chi^2(1, 53) = 41.679, p < 0.001^{**}$



Situations of smartphone use		Categorization proportion
Situation 6: toilet		
	Inappropriate	12
	Appropriate	45
	Chi-square test	$\chi^2(1, 57) = 19.105$, $p < 0.001$**
Situation 7: trip		
	Inappropriate	55
	Appropriate	2
	Chi-square test	$\chi^2(1, 57) = 49.281$, $p < 0.001$**
Situation 8: meeting		
	Inappropriate	36
	Appropriate	15
	Chi-square test	$\chi^2(1, 51) = 8.647$, $p = 0.003$**
Situation 9: working alone		
	Inappropriate	8
	Appropriate	51
	Chi-square test	$\chi^2(1, 59) = 31.339$, $p < 0.001$**
Situation 10: relaxing in the seat alone		
	Inappropriate	4
	Appropriate	58
	Chi-square test	$\chi^2(1, 62) = 47.032$, $p < 0.001$**
Situation 11: relaxing in the seat with partner		
	Inappropriate	50
	Appropriate	17
	Chi-square test	$\chi^2(1, 67) = 16.254$, $p < 0.001$**

Lastly, opposite to what was expected, not all D scores where positive. Also, no significant differences in D scores between both categorizations of a situation were found. In other words, none of the situations seem to have a general stronger association with one of both appropriateness categorizations.

Situations of smartphone use		Association strength
Situation 1: dinner		
	D of inappropriate	476.26 ms
	D of appropriate	- 6.00 ms
	Independent-samples t-test	/
Situation 2: bed time		
	D of inappropriate	504.58 ms
	D of appropriate	2.99 ms
	Independent-samples t-test	$t(58) = 1.39$, $p = 0.170$



Situations of smartphone use	Association strength
Situation 3: household chores	
D of inappropriate	424.99 ms
D of appropriate	458.99 ms
Independent-samples t-test	t(58) = -0.112, p = 0.911
Situation 4: lunching alone	
D of inappropriate	-391.61 ms
D of appropriate	279.73 ms
Independent-samples t-test	t(53) = - 1.829, p = 0.073
Situation 5: breakfast	
D of inappropriate	166.85 ms
D of appropriate	258.44 ms
Independent-samples t-test	t(51) = - 0.136, p = 0.892
Situation 6: toilet	
D of inappropriate	182.52 ms
D of appropriate	353.91 ms
Independent-samples t-test	t(55) = -0.905, p = 0.369
Situation 7: trip	
D of inappropriate	405.16 ms
D of appropriate	-765.06 ms
Independent-samples t-test	t(55) = 1.401, p = 0.167
Situation 8: meeting	
D of inappropriate	363.63 ms
D of appropriate	514.41 ms
Independent-samples t-test	t(49) = -0.360, p = 0.720
Situation 9: working alone	
D of inappropriate	188.45 ms
D of appropriate	342.60 ms
Independent-samples t-test	t(54) = -0.907, p = 0.370
Situation 10: relaxing in the seat alone	
D of inappropriate	956.18 ms
D of appropriate	714.17 ms
Independent-samples t-test	t(60) = 0.462, p = 0.664
Situation 11: relaxing in the seat with partner	
D of inappropriate	474.81 ms
D of appropriate	129.83 ms
Independent-samples t-test	t(64) = 1.117, p = 0.268

Conclusion

Altogether, the findings demonstrate that the consistency rates are not very high, since on average only 67.8% of the participants categorized the situations in a consistent way. As each situation was repeated three times, the participant potentially gained processing resources (Gawronski & De Houwer, 2014). In this way, awareness could change their categorization response in a more social desirable way (Turel et al., 2011). It must be further examined how these consistency rates can be improved to ensure the quality of this implicit association task.

Next, the categorization proportions show that participants (almost always) agree about the (in)appropriateness of smartphone use in a particular situation. As hypothesized, the specific situation in which the smartphone is used seems to be important (Arminen, 2006; Nickerson et al., 2008). Also implicitly measured, smartphone use seems to be less acceptable in social situations with co-located people (Rainie & Zickuhr, 2015). The 'individual situations' were namely significantly more categorized as appropriate, while the 'interacting situations' were significantly more categorized as inappropriate. There was only one situation about which the participants do not reach a consensus, namely using the smartphone during household chores. Possibly, it was unclear whether this is an 'individual' or an 'interacting' situation and whether household chores are linked with social interactions that can be interrupted (Nickerson et al., 2008). Lastly, for not all categorizations of situations a positive D score was found and for none of the situations, there was a significant difference between the D scores of both categorizations. However, further analyses of these D scores are needed, for example to compare the D strengths between the different situations, and to examine the tendencies of implicit responses on an individual level.

During further research, this IAT approach should be extended in several ways. First, it would be good to show the same pictures more than once in each block. Next, these pictures must be standardized, and pretested in a more rigorous way. Potentially, this can

increase the consistency rates. To end, the sample size must also be enlarged in order to increase the power. Future studies might also include more demographic information, such as age, which can potentially influence people's smartphone attitudes. Navabi et al. (2016) namely found that older adults have a negative attitude towards smartphone use due to anxiety, whereas young adults were found to be more tolerant of using smartphones during public social interactions (Rainie & Zickuhr, 2015).

Furthermore, just like the survey by Rainie and Zickuhr (2015) did not specify what 'using a cellphone' meant, this is not the case either in the used stimuli. The pictures only showed smartphone use in a particular situation, without specifying the purpose of using it, which may of course influence appropriateness attitudes. More precisely, Kumar and Sriram (2018) found differences in attitudes towards smartphone use when used in a procedural, social or compulsive way. It would also be interesting to let our adapted IAT procedure offer an addition to multimethod research, by combining this procedure with, on the one hand, self-reports of explicit attitudes towards smartphone use in the same contexts, and, on the other, their real smartphone use behavior, measured by a smartphone logging application. Adding the experience sampling method would also offer valuable information about the actual smartphone use, such as the context and its purpose.

In this way, it could be examined (1) whether smartphone use is indeed also directly driven by users' implicit attitude in combination with external attitudes (Serenko & Turel, 2018), (2) whether dissociations are found between both measures, and (3) whether it is the case that implicit attitudes towards smartphone use in particular situations is positively associated with the habit of actually using a smartphone in this situation. This might show that someone's attitude towards smartphone use becomes more tolerant with increased use. In order to work in this multimethodic way, it is important to keep in mind that the different measures must be comparable to each other (Gawronski & De Houwer, 2014).

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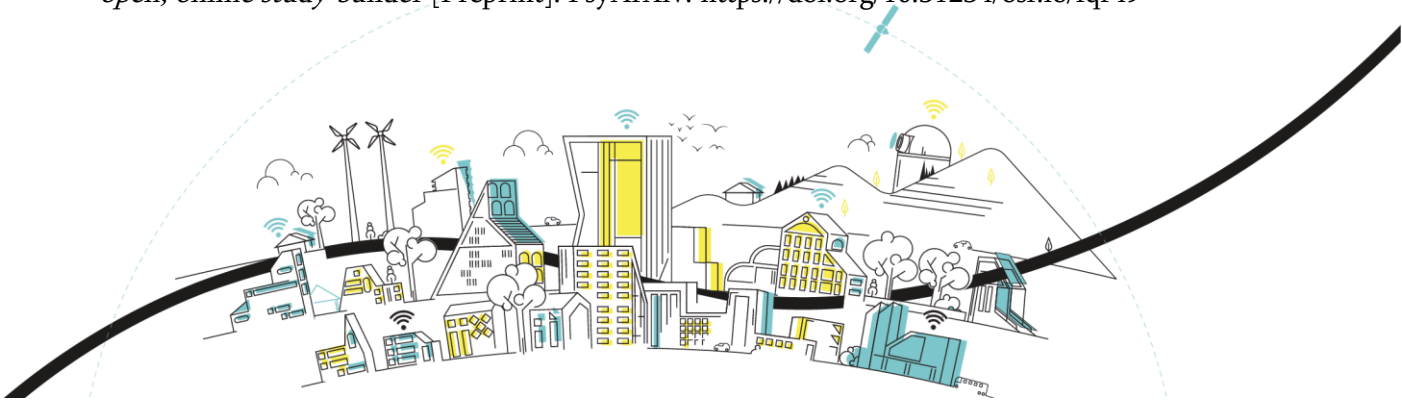

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